What is claimed is:

1. A method of bonding opposing surfaces of at least two silicon-containing articles:

providing termination groups selected from the group consisting of ≡Si-OH, ≡Si-$(OH)_2$, -Si-$(OH)_3$, and -O-Si-$(OH)_3$, and combinations thereof on the opposing surfaces and placing the opposing surfaces in contact.

2. The method of claim 1, wherein the temperature of the opposing surfaces is maintained at a temperature below 300° C during the contacting step.

3. The method of claim 1, wherein the step of providing functional groups includes contacting opposing surfaces of the articles to be bonded with a high pH solution.

4. The method of claim 3, further comprising step of cleaning the opposing surfaces with a detergent and a step of contacting the opposing surfaces with an acid.

5. The method of claim 4, further comprising grinding and polishing the opposing surfaces.

6. The method of claim 5, wherein the grinding and polishing step involves providing surfaces having a flatness less than 1 micron and a roughness less than 2.0 nm RMS.

7. The method of claim 3, wherein the pH of the high pH solution is greater than 8.

8. The method of claim 7, wherein step of contacting the opposing surfaces with the high pH solution is

performed after the step of contacting the opposing surfaces with the acid.

9. The method of claim 4, wherein the acid includes nitric acid.

10. The method of claim 9, wherein the high pH solution contains a reagent selected from the group consisting of ammonium hydroxide, potassium hydroxide and sodium hydroxide.

11. The method of claim 8, wherein the opposing surfaces are rinsed with water and placed in contact without drying the opposing surfaces.

12. The method of claim 8, further comprising a step of heating the articles to a temperature less than 300° C during the step of contacting the opposing surfaces.

13. The method of claim 12, further including a step of applying pressure of at least one pound per square inch during the step of contacting the opposing surfaces.

14. The method of claim 11, further including a step of drying the surfaces to remove absorbed water molecules from the surface and utilizing a low vacuum pressure to prevent an air gap between the surfaces.

15. The method of claim 1, wherein the articles are selected from the group consisting of a waveguide, an optical waveguide preform, a microlens array, an optical fiber array, a photonic component, a lens, a ferrule, and an optical fiber waveguide.

16. A method of directly bonding two opposing silicon-containing surfaces, comprising:

polishing the opposing surfaces;

contacting the opposing surfaces with a detergent;

contacting the opposing surfaces with an aqueous rinse solution;

contacting the opposing surfaces with an acidic solution;

contacting the opposing surfaces with a solution having a pH greater than 8; and

placing the opposing surfaces in contact.

17. The method of claim 16, further comprising heating the opposing surfaces to a temperature less than 300° C during the step of placing the opposing surfaces in contact.

18. The method of claim 17, further comprising a step of applying pressure of at least one pound per square inch during the step of placing the opposing surfaces in contact.

19. The method of claim 18, wherein the acidic solution includes nitric acid.

20. The method of claim 19, wherein the solution having a pH greater than 8 includes ammonium hydroxide, potassium hydroxide or sodium hydroxide.

22. The method of claim 16, further including a step of providing termination groups selected from the group consisting of $\equiv Si-OH$, $\equiv Si-(OH)_2$, $-Si-(OH)_3$, and $-O-Si-(OH)_3$,

and combinations thereof on the opposing surfaces and placing the opposing surfaces in contact.